

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	§	Serial No:	To Be Assigned
Richard E. Smalley et al.	§		(division of application
	§		Serial No. 09/380,545)
For: CARBON FIBERS FORMED FROM	§		
SINGLE-WALL CARBON	§	Filed: CONCURRENTLY HEREWITH	
NANOTUBES	§		
	§	Group Art Unit: 1754 (anticipated)	
	§		
Atty Dkt: 11321-P012USD8	§	Prior Examiner: Stuart Henderson	
	§	703.308.2539	

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December 28, 2001	
Date	Signature
	Gracie Segovia
	Printed Name

**PRELIMINARY AMENDMENT ACCOMPANYING REQUEST FOR FILING  
DIVISIONAL APPLICATION UNDER 37 C.F.R. § 1.53(b)**

Sir:

This paper accompanies a Request for Filing Divisional Application Under 37 C.F.R. § 1.53(b) and associated filing fee therefor ("the Request"). If the fee payment is missing or insufficient in amount, or if any other fees are determined to be due, the Assistant Commissioner, Commissioner, and/or the Director of the U.S. Patent & Trademark Office is/are hereby authorized to charge any such fees (or credit any overpayment) to Winstead Sechrest & Minick Deposit Account No. 23-2426, referencing matter number 11321-P012USD8.

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## AMENDMENTS

### In the Title

Please amend the title by replacing the present title with the following:

--CONTINUOUS FIBER OF SINGLE-WALL CARBON NANOTUBES --

### In the Abstract

Please amend the abstract by replacing the present abstract with the following:

-- This invention relates generally to carbon fiber produced from single-wall carbon nanotube (SWNT) molecular arrays. In one embodiment, the present invention involves a macroscopic carbon fiber comprising at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.--

### In the Specification

Please amend the specification as noted on page 5, paragraph 11 of the Request by inserting before the first line of the specification the following:

### --RELATED APPLICATIONS

This application is a division of co-pending prior U.S. patent application Serial No. 09/380,545, filed on September 3, 1999, entitled "CARBON FIBERS FORMED FROM SINGLE-WALL CARBON NANOTUBES," which is the 35 U.S.C. § 371 national application of International Application Number PCT/US98/04513 filed on March 6, 1998, which designated the United States, claiming priority to: provisional U.S. patent application Serial Number 60/067,325, filed on December 5, 1997; provisional U.S. patent application Serial Number 60/064,531, filed on November 5, 1997; provisional U.S. patent application Serial Number 60/063,675, filed on October 29, 1997; provisional U.S. patent application Serial Number 60/055,037, filed on August 8, 1997; provisional U.S. patent application Serial Number 60/047,854, filed on May 29, 1997; and provisional U.S. patent application Serial Number

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60/040,152, filed on March 7, 1997. Each of the foregoing applications is commonly assigned to the assignee of the present invention and is hereby incorporated herein by reference in its entirety.

This application discloses subject matter related to the subject matter of U.S. patent application Serial Number 10/000,746, filed on November 30, 2001 in the name of Daniel T. Colbert et al., entitled "MACROSCOPICALLY MANIPULABLE NANOSCALE DEVICES MADE FROM NANOTUBE ASSEMBLIES," which application is commonly assigned to the assignee of the present invention.--

### In the Claims

Please amend the claims as follows:

A. Please cancel claims 1-90, 99 and 104-162 without prejudice or disclaimer to the subject matter thereof.

B. Please amend claim 93 as follows:

93. (Amended) A composite fiber comprising a plurality of [macroscopic carbon fibers, wherein the macroscopic carbon fibers comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

C. Please amend claim 94 as follows:

94. (Amended) A molecular template array for growing continuous length carbon fiber comprising a segment of macroscopic carbon fiber, wherein the macroscopic carbon fiber comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

D. Please amend claim 98 as follows:

98. (Amended) A composite article of manufacture comprising a matrix material selected from the group consisting of metals, polymers, ceramics and cermets, said matrix comprising

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macroscopic carbon fibers, wherein the macroscopic carbon fibers comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

E. Please amend claim 100 as follows:

100. (Amended) A high voltage power transmission cable wherein at least one conductor comprises a continuous carbon fiber, wherein

- a) the continuous carbon fiber comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation; and
- b) a substantial portion of said nanotubes are of the (n,n) type.

F. Please add the following new claims 163-182:

163. (New) The fiber of claim 91 wherein the single-wall carbon nanotubes are arranged in a regular triangular lattice.

164. (New) The fiber of claim 91 wherein the fiber has a cross sectional dimension of at least one micron.

165. (New) The fiber of claim 91 wherein the fiber has a cross sectional dimension in the range between about one micron and about ten microns.

166. (New) The fiber of claim 91 wherein the fiber is at least one millimeter in length.

167. (New) The fiber of claim 91 further comprising a dopant intercalated between the single-wall carbon nanotubes.

168. (New) The fiber of claim 167 wherein the dopant comprises a substance selected from the group consisting of metals, halogens,  $\text{FeCl}_3$  and combinations thereof.

169. (New) A spun thread comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

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170. (New) A yarn comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

171. (New) A chemical filter comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

172. (New) A catalyst support comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

173. (New) A hydrogen storage material comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation and wherein the hydrogen storage material is capable of absorbing hydrogen.

174. (New) A pressure vessel for hydrogen storage comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

175. (New) A capacitor membrane comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

176. (New) An electromechanical device comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

177. (New) The electromechanical device of claim 176 wherein the device is a strain gauge.

178. (New) A power transmission cable comprising a plurality of macroscopic carbon fibers, wherein at least some of the plurality of the macroscopic carbon fibers comprise at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation.

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179. (New) The cable of claim 178 wherein the cable is a coaxial cable.
180. (New) The cable of claim 178 wherein the cable comprises an outer conductor and an inner conductor and wherein at least one of the outer conductor and the inner conductor comprise a plurality of single-wall carbon nanotubes.
181. (New) The cable of claim 178 wherein the cable comprises at least two conducting elements and wherein the at last two conducting elements comprise a plurality of single-wall carbon nanotubes.
182. (New) The cable of claim 181 wherein the cable comprises alternating metallic carbon fiber conductors and insulating layers.

### REMARKS

A. *Status of the Application.* On September 3, 1999, Applicant filed the parent patent application, U.S. patent application Serial No. 09/380,545, which included originally filed claims 1-162. In an Office Action, dated June 20, 2000, ("the Office Action") the Examiner subjected the claims to a restriction requirement. According to the Office Action, the parent patent application's claims were directed to eleven (11) distinct inventions. Applicant elected the invention of Group VIII in the parent patent application. The present divisional application is directed to the invention of Group IX, which were identified as the invention claimed by originally filed claims 91-103.

Accordingly, originally filed claims 91-98 and 100-103 remain in the application, and the other originally filed claims -- claims 1-90, 99 and 104-162 -- are cancelled herein without prejudice or disclaimer to the subject matter thereof. Additionally, claims 163-182 have also been added herein. No new matter is added by the addition of these claims.

B. *Amended Claims.* Claims 93-94, 98 and 100 are amended herein. The Applicant respectfully asserts that the amendment to claims 93-94, 98 and 100, and incorporated by reference in any claims depending therefrom, are not narrowing amendments made for a reason related to the statutory requirements for a patent that will give rise to prosecution history

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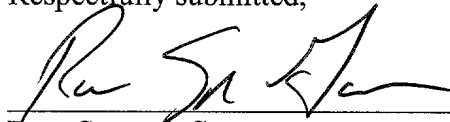
estoppel. *See Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 555, 566, 56 U.S.P.Q.2d 1865, 1870 (Fed. Cir. 2001).

Attached hereto is a marked-up version of the changes made to claims 93-94, 98 and 100 by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made."

### CONCLUSION

It is believed that each of the claims now pending in the present application recites elements neither taught nor suggested by the prior art. Further, it is believed that the application as a whole is in proper form and condition for allowance. If the Examiner believes that the application may be placed in even better condition for allowance, he or she is invited to contact the undersigned at the telephone number noted below. Alternatively, or in addition, if the Examiner believes that an Examiner interview would be beneficial, the Examiner is invited to note that the undersigned has ready access to the videoconferencing facilities of the South Central Intellectual Property Partnership at Rice University in Houston, Texas. The inventors and the undersigned would welcome the opportunity to use those facilities to clarify any issues deemed to remain unresolved.

Respectfully submitted,



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Date: December 28, 2001

ATTORNEYS FOR ASSIGNEE

**Version with Markings to Show Changes Made**

93. (Amended) A composite fiber comprising a plurality of [the] macroscopic carbon fibers, wherein the macroscopic carbon fibers comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation [of claim 91].

94. (Amended) A molecular template array for growing continuous length carbon fiber comprising a segment of [the] macroscopic carbon fiber, wherein the macroscopic carbon fiber comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation [of claim 91].

98. (Amended) A composite article of manufacture comprising a matrix material selected from the group consisting of metals, polymers, ceramics and cermets, said matrix [having embedded in at least a portion thereof a property enhancing amount of the] comprising macroscopic carbon fibers, wherein the macroscopic carbon fibers comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation [of claim 91].

100. (Amended) A high voltage power transmission cable wherein at least one conductor comprises a continuous carbon fiber, wherein

- a) the continuous carbon fiber comprises at least about  $10^6$  single-wall carbon nanotubes in generally parallel orientation; and
- b) a substantial portion of said nanotubes are of the (n,n) type [according to claim 96].